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REMARKS

Applicants appreciate the Examiner's thorough review of the present application as evidenced by the Official Action. In this regard, the Official Action rejects all of the claims, namely Claims 1-27, under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,381,586 to Glasserman et al., in view of U.S. Patent No. 6,157,918 to Sheperd, and further in view of U.S. Patent No. 6,061,662 to Makivic. The Official Action also rejects all of the claims under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which Applicants regard as the invention. Further, the Official Action rejects Claims 19-27 under 35 U.S.C. § 101 for failing to describe a concrete, useful and tangible output. As explained more fully below, none of the cited references, taken individually or in combination, teach or suggest the claimed invention of Claims 1-27. As also described below, Applicants respectfully submit that all of the claims do particularly point out and distinctly claim the subject matter which Applicants regard as the invention, and Claims 19-27 do describe a concrete, useful and tangible output. Therefore, Applicants respectfully traverse the rejections of the claims under §§ 101, 103(a) and 112, second paragraph.

A.   The Claims are Patentably Distinct from the Cited References

The Glasserman patent discloses a method of pricing derivative securities by selecting an importance sampling distribution and combining the importance sampling distribution with stratification or Quasi-Monte Carlo (QMC) simulation. As disclosed, Monte Carlo simulation, which is widely used in financial pricing, can be inefficient due to large variances associated with option price estimates produced by the method. As such, a number of variance reduction techniques have been developed to overcome such inefficiencies. In general, then, the method of the Glasserman provides a more efficient Monte Carlo technique with improved variance reduction through the use of Hessian matrices and Eigenvectors. With the method of the Glasserman patent, option prices can be estimated. In this regard, the Glasserman patent provides a number of numerical examples of pricing options according to a risk-neutral valuation approach that defines a risk-free interest rate, r or r_0. In the examples, the pricing options

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method according to the Glasserman patent are shown to be more efficient than traditional Monte Carlo methods.

The Makivic patent discloses a Monte Carlo system and method for pricing financial instruments. In this regard, Monte Carlo methods in financial calculations can be based on the risk-neutral valuation approach, which defines the expected return on the financial instrument to equal the risk-free interest rate. Col. 4, lines 31-34; and col. 10, lines 25-27. As disclosed, a path-integral approach is disclosed that relies upon a probability distribution of the complete paths (histories) of a financial instrument. A Metropolis algorithm is used to generate samples of a probability distribution of the paths of the instrument. In this regard, the Metropolis algorithm constructs a Markov process in the path space, which asymptotically samples the path probability distribution to arrive at an equilibrium distribution. Then, if the statistical error is below a desired level of accuracy, Monte Carlo estimates are computed. Then, a Monte Carlo estimate of the option price can be obtained. See col. 5, lines 55-58; col. 6, lines 23-25; and col. 6, line 59 – col. 7, line 1. Generally, then, the Makivic patent focuses on computing an implied volatility, and making the process more efficient through sampling different regions of the price path space according to the respective contributions to the payoff function.

The Shepherd patent discloses methods and an apparatus relating to formulation and trading of investment contracts. As disclosed, an ordering party inputs contract data relating to a phenomenon that has a range of future outcomes and a future time of maturity. The contract data comprises a number of probabilities of occurrence for each future outcome, and a consideration due a counterparty at or after the time of matching a contract with a counterparty. A counterparty inputs registering data that includes a set of probabilities of occurrence for each outcome in the range. A data processing means prices and matches a contract for the phenomenon from the contract data and registering data. Shepherd '918 Abstract.

As recited in independent Claims 1, 10 and 19, respectively, a method, system and computer program product are provided for performing a contingent claim valuation. As recited, a present value distribution of contingent future benefits attributable to the exercise of the contingent claim at a subsequent time is determined by discounting a distribution of contingent future benefits according to a first discount rate. A present value of a contingent future

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investment required to exercise the contingent claim at the subsequent time is also determined, where the present value of the contingent future investment is determined based upon a second discount rate that need not equal the first discount rate. The value of the contingent claim can then be determined based upon the present value distribution of contingent future benefits and the present value of the contingent future investment.

In contrast to the method, system and computer program product of independent Claims 1, 10 and 19, respectively, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest determining a present value distribution of contingent future benefits. In fact, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest any present value distribution, whether of contingent future benefits or otherwise. Also, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest determining a present value of a contingent future investment with a second discount rate that can differ from a first discount rate used to determine a present value distribution of contingent future benefits, as also recited in independent Claims 1, 10 and 19.

As indicated above, the Shepherd patent discloses methods and an apparatus relating to formulation and trading of investment contracts. In this regard, while the Shepherd patent discloses formulating and trading investment contracts, the Shepherd patent neither teaches nor suggests a method of valuing such contracts, as recited in independent Claims 1, 10 and 19. In contrast, the Shepherd patent merely discloses that net contingent entitlement amounts are determined, without teaching or suggesting a method of determining such entitlement amounts.

In contrast to the Shepherd patent, both the Glasserman and Makivic patents do disclose methods of pricing options. However, neither the Glasserman patent nor the Makivic patents teach or suggest pricing options utilizing two discount rates. As indicated above, both the Glasserman and Makivic patents price options according to the risk-neutral approach, whereby only a single risk-free interest rate is defined. In contrast, the invention of independent Claims 1, 10 and 19 utilize two discount rates that need not equal one another. Further, in valuing options, neither the Glasserman nor the Makivic patents teach or suggest determining a present value distribution of contingent future benefits. In this regard, the Glasserman patent discloses a more

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efficient Monte Carlo technique with improved variance reduction through the use of Hessian matrices and Eigenvectors. The Makivic patent discloses a Monte Carlo method that computes an implied volatility, and makes the process more efficient through sampling different regions of the price path space according to the respective contributions to the payoff function.

Therefore, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest determining a present value distribution of contingent future benefits with a first discount rate, or determining a present value of a contingent future investment with a second discount rate that can differ from a first discount rate, as recited in independent Claims 1, 10 and 19. As such, Applicants respectfully submit that independent Claims 1, 10 and 19 are patentably distinct from the Glasserman, Makivic and Shepherd patents, taken either individually or in combination. Applicants further respectfully submit that the rejection of independent Claims 1, 10 and 19 under 35 U.S.C. § 103(a) is overcome. And as dependent Claims 2-9, 11-18 and 20-27 depend, either directly or indirectly, from independent Claims 1, 10 and 19, respectively, Applicants also respectfully submit that the rejection of dependent Claims 2-9, 11-18 and 20-27 under 35 U.S.C. § 103(a) is overcome.

B.   The Claims Comply with 35 U.S.C. § 112, Second Paragraph

As indicated above, the Official Action rejected all of the claims under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which Applicants regard as the invention. More particularly, the Official Action indicated that Applicants are requested to present the defining equations, conditions and assumptions in the model formulation, along with the derivations, in sufficient detail so that one of ordinary skill in the art can evaluate the model. Applicants respectfully submit, however, that the claims do, in fact, set forth the subject matter which Applicants regard as the invention.

As described in M.P.E.P. § 2171, the requirement under § 112, second paragraph, that the claims set forth the subject matter that Applicants regard as the invention, is a subjective requirement as it depends on what the Applicants regard as their invention. In this regard, M.P.E.P. § 2172 states that "[a] rejection based on the failure to satisfy [the requirement that the claims set forth the subject matter that the applicant regards as the invention] is appropriate only

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where applicant has stated, <u>somewhere other than in the application as filed</u>, that the invention is something different from what is defined by the claims." (emphasis added). Section 2172 continues by stating that "the invention set forth in the claims must be presumed, in the absence of evidence to the contrary, to be that which applicants regard as their invention." *Id. citing In re Moore*, 439 F.2d 1232 (C.C.P.A. 1971).

Applicants respectfully submit that the current set of claims do, in fact, set forth the subject matter which Applicants regard as the invention. In this regard, Applicants have given no indication, nor as any evidence been put forth to show, that the scope of the claims do not correspond in with that which Applicants regard as their invention. In fact, Applicants respectfully submit that no evidence could possibly exist as this response to the first Official Action is the first correspondence of Applicants with respect to the claimed invention, and as the content of Applicants' specification cannot be used as evidence that the scope of the claims do not correspond with the subject matter Applicants regard as their invention.

Applicants note that the Official Action requested that Applicants present the defining equations, conditions, assumptions in the model formulation, and the derivations, in sufficient detail such that one of ordinary skill in the art can evaluate the model. Applicants submit, however, that the specification does include model equations, conditions, assumptions and derivations in sufficient detail to enable one skilled in the art to practice the claimed invention. For example, as described on page 15 of the present application, the valuation of a contingent claim according to the present invention can be represented as given in the following equation (1):

$$E[max(s_j e^{-\mu T} - xe^{-rT}),0] = \int_{-xe^{-rt}}^{\infty} (s_T e^{-\mu T} - xe^{-rt}) g(y) dy$$

Then, through a series of substitutions shown in equation (2) through equation (8), it can be shown that in instances in which the assumptions of the Black-Scholes method hold true for the present invention, the methodology of Black-Scholes is equivalent to the method of the present invention. Applicants respectfully submit, then, that the current set of claims set forth the subject matter which Applicants regard as the invention, as required by 35 U.S.C. § 112, second

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paragraph. Applicants also respectfully submit that the rejection of the claims under § 112, second paragraph is therefore overcome.

C.   Claims 19-27 Comply with 35 U.S.C. § 101

As also indicated above, the Official Action rejected Claims 19-27 under 35 U.S.C. § 101 for failing to describe a concrete, useful and tangible output. Applicants respectfully submit, however, that the claims do, in fact, describe a concrete, useful and tangible output. Therefore, Applicants respectfully traverse the rejection of Claims 19-27 under § 101.

As stated by the Court of Appeals for the Federal Circuit in *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, a claimed invention must produce a "useful, concrete and tangible result." 149 F.3d 1368, 1373 (Fed. Cir. 1998). As described in M.P.E.P. § 2106, Part II.C., in analyzing the claims of an application, product claims will include limitations defining discrete physical structures that may be comprised of hardware or a combination of hardware and software. As also described, "a claimed computer-readable medium encoded with a data structure defined structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory." *Id.* at Part IV.B.1.(a) (emphasis added). Thus, "[w]hen a computer program is recited in conjunction with a physical structure, such as a computer memory, Office personnel should treat the claim as a product claim." *Id.* (emphasis added). When a computer program is recited as part of a claim that recites an otherwise statutory manufacture, "the claim remains statutory irrespective of the fact that a computer program is included in the claim." *Id.*

Independent Claim 19 recites a computer program product that comprises a computer-readable storage medium. In turn, the computer-readable storage medium has computer-readable program code portions stored therein, where the computer-readable program code portions comprise the recited first, second and third executable portions. In this regard, the third executable portion determines a value of the contingent claim based upon a present value distribution of contingent future benefits and a present value of the contingent future investment. In other terms, consistent with the definition of statutory subject matter in M.P.E.P. § 2106,

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independent Claim 19 recites a computer program product comprising a computer memory encoded with three executable portions, i.e., the first, second and third executable portions.

Applicants also note that as much as the claims at issue in *State Street*, the Claims 19-27 recite a computer program product that produces a "useful, concrete and tangible result." In *State Street*, the claims at issue were drawn to a system for permitting an administrator to monitor and record the flow of financial information and make all necessary calculations for maintaining a partner fund financial services configuration. 149 F.3d at 1371. In holding that the claimed system at issue in *State Street* was patentable subject matter, the court stated, "the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula or calculation, because it produces 'a useful, concrete and tangible result' – a final share price momentarily fixed for recording and reporting purposes ...." *Id.* at 1373.

Similar to the claimed subject matter at issue in *State Street*, the computer program product of Claims 19-27 transform data into a value of a contingent claim. Such a value, then, can be used in contexts, such as in financial determinations and project evaluations, to determine whether to exercise the contingent claim, such as by further investing in a project. As such, the value of the contingent claim can be considered to be a "useful, concrete and tangible result" of the claimed computer program product. Applicants therefore respectfully submit that independent Claim 19 recites statutory subject matter, as required by 35 U.S.C. § 101. Applicants therefore respectfully submit that the rejection of independent Claim 19 under § 101 is overcome. Further, as dependent Claims 20-27 depend, either directly or indirectly, from independent Claim 19, Applicants respectfully submit that the rejection of dependent Claims 20-27 under § 101 is also overcome.
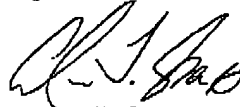
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CONCLUSION

In view of the remarks presented above, it is respectfully submitted that the present claims are in condition for immediate allowance. It is therefore respectfully requested that a Notice of Allowance be issued. The Examiner is encouraged to contact Applicants' undersigned attorney to resolve any remaining issues in order to expedite examination of the present application.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.
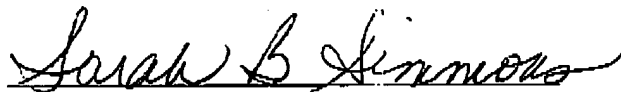
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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office at Fax No. 703-872-9326 on March 18, 2003.

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